

Training on Diversifying Processed Fish Products into Meatballs and Satay for Fishermen's Wives in Nangadhero Village, Nagekeo Regency

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Abstract: This community service activity aimed to improve the knowledge and skills of fishermen's wives in Nangadhero Village in diversifying processed fish products into fish meatballs and fish satay as value-added products. The program was conducted using the Participatory Action Research (PAR) approach through the stages of problem identification, socialization, training, hands-on practice, and evaluation. A total of eight fishermen's wives participated in the training. Program evaluation was carried out through direct observation of participants' practical skills in each stage of fish processing, complemented by discussions and feedback sessions. The evaluation results indicated that 95% of the participants successfully achieved the expected competencies in terms of knowledge, technical skills, and active participation throughout the training. Participants were able to independently perform all stages of producing fish meatballs and fish satay, from raw material preparation to the final product. Economic analysis further demonstrated that processing fish into meatballs and satay generated an estimated 94% higher profit compared with selling fresh fish directly, highlighting the economic feasibility of product diversification. In addition to improving technical competencies, the program enhanced participants' understanding of entrepreneurship opportunities based on local fishery resources. Therefore, this training provides an effective community empowerment strategy to increase the added value of fishery products while supporting sustainable household income among fishermen's families.

Keywords: Diversification of Processed Fish Products; Fish Meatballs; Fish Skewers; Fishermen's Wives; Community Empowerment

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INTRODUCTION

Nangadhero Village is one of the coastal villages in Nagekeo Regency characterized by a spirit of mutual cooperation (Ani et al., 2024) and possessing significant fisheries potential. The abundant supply of fish presents an opportunity for the community to develop various processed products with higher market value. Most of the fish catch is still sold fresh, with relatively low added value. This situation means that the economic potential of the fisheries sector has not yet been fully utilized by coastal communities.

Limited knowledge and skills among the community regarding the diversification of processed fish products have led to the continued dominance of fresh fish sales in the utilization of fishery products, resulting in suboptimal added value (Supit et al., 2026). In addition, the main factors hindering the development of fish processing businesses include low processing technology capacity, limited capital, and weak marketing networks (Fitriana et al., 2022). Therefore, efforts are needed to enhance human resource capacity through training and guidance in fish processing so that they can produce products with higher market value.

In this context, women particularly fishermen's wives play a crucial role in supporting household economies. Their involvement in fish processing activities can not only increase the value-added of products but also open up new business opportunities that contribute to higher incomes for fishing families. With adequate skills, fishermen's wives can become key players in the development of sustainable, household-based fish processing businesses (Nur et al., 2022; Hasanah et al., 2025).

Fish meatballs and fish satay are processed products with good market prospects because they are popular among various segments of the population. Both products are relatively easy to make, are high in protein, and can serve as promising alternatives for home-based businesses. Processing fish into meatballs and satay also extends the shelf life and increases the market value of the products compared to fresh fish. According to Lisanty et al. (2022), processing fish into meatballs is a form of product diversification that can increase economic value added and provide opportunities for the development of home-based businesses.

Products that are of insufficient quality to be sold as fresh fish can be processed into value-added products that still hold market value. In this way, waste can be minimized, waste is reduced, and the utilization of raw materials becomes more optimal. Efficiency is also evident in product distribution, as processed products have a longer shelf life and can be marketed to a wider area compared to fresh products. Thus, diversification is not merely a marketing strategy but also an effort to create a more effective and efficient production system (Radhiana et al., 2025).

Processing fish into fishballs and satay not only aims to increase the variety of fish consumption but also extends shelf life, improves product quality, and provides a higher market value compared to selling fish in its fresh form. Diversification of fishery products also serves as a solution to reduce post-harvest losses caused by the fish's susceptibility to quality degradation. Given these conditions, this community service activity was conducted with the aim of enhancing the knowledge and skills of fishermen's wives in making fish meatballs and fish satay, thereby enabling them to create new business opportunities that can increase the income of fishing families in Nangadhero Village.

METHOD

The community service activity was carried out in Nangadhero Village, Aesesa Subdistrict, Nagekeo Regency, on June 7, 2026, targeting a group of fishermen's wives. The activity utilized a Participatory Action Research (PAR) approach, which emphasizes active community involvement in every stage of the activity from problem identification and program

implementation to evaluation of results. This approach was chosen so that participants would not merely be beneficiaries but would also play an active role in the learning process and in developing solutions based on the potential of local fishery resources (Kadju *et al.*, 2026).

The activity began with identifying issues through field observations and interviews with groups of fishermen's wives to gather information on how fish catches are utilized, the processing skills they possess, and the potential for developing fisheries-based businesses. The findings indicated that sales of fresh fish still dominate, meaning that the added value of the products has not yet been optimized. Based on these findings, an awareness campaign was conducted on the importance of diversifying processed fish products, the economic benefits of processing fishery products, and opportunities for developing household businesses.

The implementation phase was carried out through demonstrations and hands-on practice in making fish meatballs and fish satay. The community service team demonstrated each stage of processing, starting from the selection of raw materials, preparation of fish meat, mixing of ingredients, shaping of the products, to the cooking process. After the demonstration, participants practiced all the steps independently with guidance from the outreach team. The hands-on approach was chosen so that participants could gain real-world experience in processing fishery products into value-added goods.

The activity was evaluated at the end of the training through observation of the participants' ability to practice each step of making fish meatballs and fish satay, as well as through discussions and question-and-answer sessions to gather feedback on the participants' understanding of the material presented. The evaluation results were used to assess the achievement of the activity's objectives and to identify opportunities for developing fish-based processed food businesses in Nangadhero Village.



Figure 1. Flowchart of Community Service Activities

RESULTS AND DISCUSSION

Implementation of a Training Program on Diversification of Processed Fish Products

This community service activity was carried out in Nangadhero Village, Aesesa Subdistrict, Nagekeo Regency, with 8 fishermen's wives as the primary participants. The selection of this target group was based on the conditions of the coastal community, which has access to fishery resources; however, the utilization of these resources is still dominated by the sale of fresh fish, resulting in relatively low economic value added. These conditions highlight the need to enhance community capacity particularly among women as household managers to develop processed fish products with higher economic value. Therefore, the training on diversifying processed fish products into fish meatballs and fish satay was designed as a community empowerment strategy based on local potential, aimed at improving skills, creating business opportunities, and strengthening the economic resilience of fishing families.

The event began with an awareness-raising session aimed at helping participants understand the importance of diversifying processed fish products as a means of increasing the added value of their catch. In addition to presenting material on the potential for developing fishery products, the community service team also discussed various challenges faced by the

community in utilizing their fish catch, such as limited processing skills, a lack of product innovation, and limited knowledge of marketing opportunities for processed products. The participatory discussion provided participants with an opportunity to share their experiences, needs, and expectations regarding the program, allowing the training materials to be tailored to the community's actual circumstances.



Figure 2. Orientation and initial discussion with participants in the training program on the diversification of processed fish products.

This approach aligns with the principles of Participatory Action Research (PAR), which positions the community as the primary agent of social change through active involvement at every stage of the process, from problem identification to program evaluation (Cornish et al., 2023). In the PAR approach, the community is not positioned merely as beneficiaries, but as partners who contribute to formulating needs, developing solutions, and reflecting on the results of activities that have been carried out (Baum et al., 2006). The active involvement of participants during the outreach process demonstrates that program implementation is not only oriented toward knowledge transfer but also toward strengthening the community's capacity to recognize the potential of its own resources and develop sustainable alternatives for their utilization.

Throughout the event, participants showed great enthusiasm for both the presented material and the discussion sessions. This enthusiasm was evident in their active participation in sharing various experiences regarding the management of fish catches, the challenges faced in developing household businesses, and opportunities for product diversification that could be implemented in their communities. A high level of participation is a key indicator of the success of community empowerment programs, as it demonstrates alignment between community needs and the interventions provided. According to Nur et al. (2022), the active involvement of coastal women in every stage of empowerment activities is a primary factor in enhancing the success of household-based fishery product processing programs. Similar results were also reported by Hasanah et al. (2025), who stated that involving fishermen's wives from the planning stage through to the implementation of activities can increase their sense of ownership of the program, thereby increasing the likelihood of the activities' sustainability.

The success of the program's initial phase was also supported by a participant-centered learning approach, which combined instruction, interactive discussions, demonstrations, and hands-on practice. This approach enabled participants not only to gain new knowledge about the diversification of processed fish products but also to understand the relevance of the material to the socioeconomic conditions they face. From the perspective of adult learning, the learning process is more effective when participants are actively engaged in solving problems related to their daily experiences (Knowles et al., 2015). Therefore, the orientation and discussion sessions at the beginning of the program are crucial stages, as they help build participants' motivation to learn while enhancing their readiness to fully engage in the training.

An initial evaluation of the program's implementation showed that all participants completed the program with an excellent level of participation. Based on observations and

program evaluations, more than 95% of participants demonstrated good progress in terms of their initial knowledge regarding the importance of diversifying processed fish products, their engagement in discussions, and their readiness to participate in fisheries product processing practices. These results indicate that the outreach strategy implemented successfully enhanced participants' understanding of the importance of fish processing as an alternative for increasing product value and supporting business development based on local potential. These findings reinforce the notion that the outreach phase in community empowerment programs serves not only as a medium for conveying information but also as a process for building community awareness, motivation, and commitment to actively participate in the entire series of community service activities.

Enhancing Participants' Knowledge and Skills Through Training on the Diversification of Processed Fish Products

After attending the outreach session, participants received technical training on the diversification of processed fish products through the preparation of fish meatballs and fish satay. The training was conducted using a demonstration method combined with hands-on practice (learning by doing), so that participants not only gained a conceptual understanding of the stages of fishery product processing but also gained direct experience in processing fish into value-added products. This method was chosen because it is considered more effective in building skills than learning that relies solely on theoretical instruction. Through demonstrations, participants could systematically observe each stage of the process, while hands-on practice provided them with the opportunity to develop skills through real-world experience.



Figure 3. A demonstration of how to make fish meatballs by the community service team for the participants.

During the fish meatball training session, participants were introduced to techniques for selecting raw materials, cleaning fish, separating meat from bones, mixing ingredients, shaping the dough, and boiling the meatballs. Throughout the activity, each participant had the opportunity to practice all these steps with direct guidance from the outreach team. The guidance was provided intensively to ensure that every participant understood the correct processing procedures and could produce products with the appropriate texture, taste, and shape. Observations during the practical session showed that participants were able to follow each step well and demonstrated improved skills in processing fishery products into value-added goods.



Figure 4. Fish meatballs produced by participants during the training.

Based on the evaluation results, more than 95% of participants achieved a “good” rating in the skill category for fish meatball production. This success demonstrates that a demonstration-based approach combined with hands-on practice can enhance participants’ ability to effectively master fish processing techniques. This finding aligns with the research by Lisanty *et al.* (2022), which reported that practice-based training in fish meatball processing can improve the community’s skills in producing processed products with economic added value. Additionally, mastering practical skills serves as a foundation for the community to develop home-based businesses, as the production process can be carried out using simple equipment that is readily available in the local community.

The training then continued with the preparation of fish satay as a form of processed product diversification with promising market prospects. Participants received training on techniques for cutting fish into uniform pieces, the seasoning process, threading the fish onto skewers, grilling techniques, and product presentation. These steps were designed not only to produce products with excellent flavor but also to instill an understanding of the importance of consistent product quality as a key factor influencing competitiveness in the market.



Figure 4. A demonstration of how to make fish satay by the community service team for the participants.

Throughout the practical training, participants demonstrated a high level of engagement in every stage of the activities. The discussions that took place during the training process showed that participants were beginning to understand the relationship between the quality of raw materials, processing techniques, and the quality of the final product. This indicates that the learning process not only focused on psychomotor skills but also enhanced participants’ ability to understand the basic principles of safe, hygienic, and economically viable food processing. This approach aligns with the concept of experiential learning proposed by Kolb (2015), namely that direct experience serves as an effective learning medium for building new

knowledge and skills through the process of doing, observing, reflecting, and reapplying that experience.

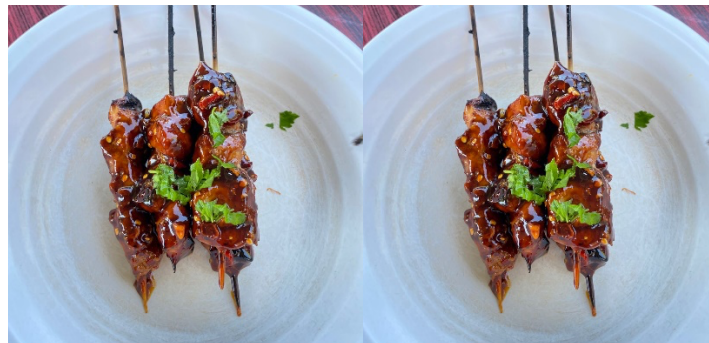


Figure 5. Fish satay products made by participants during the training.

The evaluation results showed that more than 95% of the participants were able to independently carry out all stages of fish satay production in accordance with the procedures that had been demonstrated. This success indicates that the participants have mastered the basic skills in the diversification of processed fish products and are capable of producing products that are safe for consumption and have market potential. These findings support the results of community service studies by Hasanah *et al.* (2025) and Nur *et al.* (2022), which state that practice-based training in fishery product processing can enhance the capacity of coastal women to develop household businesses that utilize the potential of local resources. Thus, the training not only improved the participants' technical skills but also strengthened their confidence in utilizing fish catches as commodities with higher added value.

Overall, the improvement in participants' knowledge and skills as evidenced by a success rate of over 95% in learning outcomes indicates that a combination of demonstration, hands-on practice, and mentoring is an effective approach in community empowerment activities. According to Knowles *et al.* (2015), adult learning is most effective when participants are actively engaged in the learning process and have the opportunity to directly apply the material they have learned. This is also consistent with the Participatory Action Research approach (Cornish *et al.*, 2023), which positions the community as the primary actors in the learning process, ensuring that the skills acquired are not merely temporary but have the potential to develop into capacities that can be utilized sustainably. From a fisheries development perspective, such activities to diversify processed fish products also support efforts to increase the value added of fisheries products, as recommended by the FAO (2024) namely, through the development of processed products that can enhance competitiveness, reduce post-harvest losses, and expand economic opportunities for coastal communities.

Evaluation of the Training Program's Success

To assess the effectiveness of the program, an evaluation was conducted on three main aspects: knowledge, skills, and participant responses. The knowledge assessment was conducted through discussions and questions regarding the concept of fish product diversification, processing stages, and opportunities for developing fisheries-based businesses. Skills were evaluated by observing participants' ability to practice each step of making fish meatballs and fish satay, while participant responses were measured using a simple questionnaire that assessed their level of acceptance of the material, training methods, and benefits of the program. The program was deemed successful if more than 95% of participants achieved a "good" rating in each evaluated aspect.

Table 1. Results of the Evaluation of the Success of the Fish Product Diversification Training Program

Evaluation Criteria	Indicators of Success	Evaluation Results
Knowledge	Understanding the concept of fish product diversification, processing stages, and business opportunities	>95% of participants achieved a “good” rating
Skills	Being able to make fish meatballs and fish skewers according to procedure	>95% of participants achieved a “good” rating
Participant Responses	Responding positively to the content, methods, and benefits of the activity	>95% of participants gave positive feedback

The evaluation results show that the training program had a positive impact on participants’ capacity building. In terms of knowledge, most participants understood the importance of diversifying processed fish products as a strategy to increase the value added of their catch while expanding business opportunities for their households. This understanding was reflected in the participants’ ability to explain the stages of fish processing, the benefits of product diversification, and the economic potential that can be developed through fisheries-based businesses. Improving knowledge is a crucial foundation for community empowerment activities because behavioral change is generally preceded by a deeper understanding of an innovation. This finding aligns with Nur et al. (2022) and Matonda et al. (2026), who state that increasing community knowledge is the first step toward building the economic independence of coastal women through the utilization of fishery products.

In terms of skills, the observation results showed that more than 95% of participants were able to independently carry out all stages of making fish meatballs and fish satay in accordance with the procedures demonstrated by the community service team. These skills encompassed the preparation of raw materials, fish meat processing, ingredient mixing, product shaping, the cooking process, and the serving of the final product. This achievement indicates that the demonstration method combined with hands-on practice is effective in improving participants’ skills. According to Knowles et al. (2015), adult learning yields more optimal results when participants have the opportunity to learn through real-world experiences relevant to their needs. This is also supported by Kolb’s (2015) theory of experiential learning, which explains that direct experience allows participants to integrate new knowledge with prior experiences, making the acquired skills more meaningful and easier to apply in daily life.

Participants’ responses to the program also showed very positive results. More than 95% of participants stated that the training materials were easy to understand, that the demonstration methods facilitated the learning process, and that the skills they acquired could potentially be applied to home-based businesses. The high level of participant satisfaction indicates that the training materials were well-suited to the community’s needs and local conditions. From a community empowerment perspective, participants’ positive responses are a key indicator that the intervention provided is relevant to community needs, thereby increasing the program’s chances of sustainability (Baum et al., 2006). This finding also supports the results of the community service project by Hasanah et al. (2025), who reported that the active involvement of coastal women in training on the processing of fishery products was able to increase their motivation to develop businesses based on local resources.

The program’s success was also due in part to the implementation of the Participatory Action Research (PAR) approach, which provided participants with the opportunity to actively participate in the entire series of activities. During the training process, participants not only followed the instructions provided by the outreach team but also discussed their experiences in

managing their fish catches, identified the challenges they faced, and formulated alternative solutions that could be implemented after the program concluded. This approach fosters a more context-specific, two-way learning process, enabling participants to feel a sense of ownership over the program and motivating them to apply the skills they've acquired in their daily lives. According to Cornish *et al.* (2023), active community involvement in every stage of the activities is a key characteristic of PAR that enhances the effectiveness of empowerment programs because the solutions developed stem from the community's real needs.

Overall, the evaluation results indicate that the training on the diversification of processed fish products has achieved its stated objectives. A success rate of over 95% in terms of participants' knowledge, skills, and responses demonstrates that the program not only successfully enhanced participants' technical capabilities in processing fishery products but also fostered the community's motivation and readiness to harness the potential of local resources as an alternative source of income. These results reinforce the findings of Supit *et al.* (2026) that the diversification of processed fish products is an effective strategy for increasing the value added of fishery products while strengthening the economic capacity of coastal communities. Furthermore, the development of processed fish products is also in line with the FAO's (2024) recommendations, which emphasize the importance of innovation in fish processing as a means to enhance product competitiveness, reduce post-harvest losses, and support sustainable fisheries-based economic development.

CONCLUSION

A community service initiative involving training on the diversification of processed fish products into fish meatballs and fish satay successfully enhanced the capacity of fishermen's wives in Nangadhero Village to transform fishery products into value-added goods. The Participatory Action Research (PAR) approach, implemented through stages of outreach, demonstrations, hands-on practice, and evaluation, encouraged active participant engagement throughout the training process. Evaluation results showed that more than 95% of the 8 participants achieved a "good" rating in terms of knowledge, skills, and response to the activities. Participants were not only able to independently practice the processes of making fish meatballs and fish satay but also understood the potential of product diversification as an alternative for developing household businesses based on local fishery resources.

This program contributes to efforts to empower coastal women by enhancing their productive skills, which have the potential to increase the income of fishing families. To ensure the sustainability of the program's benefits, ongoing support is needed, focusing on product packaging, business licensing, food safety certification, digital marketing strategies, and institutional strengthening of business groups. Collaboration among universities, local governments, and the community is a key factor in supporting the program's sustainability, ensuring that the diversification of processed fish products not only increases the value added of fishery products but also contributes to the sustainable economic development of coastal communities.

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